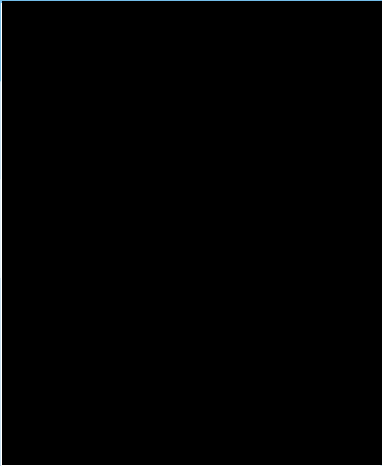A. Briefly answer the following questions.

   1. Why does the net total ATP output from glucose range from 30–32 molecules?

   2. Why is cellular respiration considered a process of energy conversion?

B. Perform an activity called "ATP Arithmetic." This activity presents hypothetical situations. Compute individually the total ATP output in each case. This is an individual exercise.

1. Compute the net ATP yield from the complete aerobic metabolism of one molecule of glucose. You may use the following format:

| Stage of Aerobic Cellular Respiration | ATP Yield in | |
| --- | --- | --- |
| | Brain and Skeletal Muscle Cells | |
| glycolysis | from substrate-level phosphorylation: _____ | |
| citric acid cycle | from substrate-level phosphorylation: _____ | |
| oxidative phosphorylation | from reduced electron carriers from:<br>a. glycolysis: _____<br>b. pyruvate oxidation: _____<br>c. citric acid cycle: _____ | |
| **gross ATP yield** | | |
| number of ATP molecules to be deducted | | |
| **net ATP yield** | | |

2. Using the same format as the preceding table, compute the net ATP yield from one glucose molecule in the following hypothetical cases. (Assume that the defect in one stage does not affect the function of the previous stages.)
   a. The cell cannot perform pyruvate oxidation due to a defect in the PDH complex.
   b. There is no substrate-level phosphorylation during the citric acid cycle.
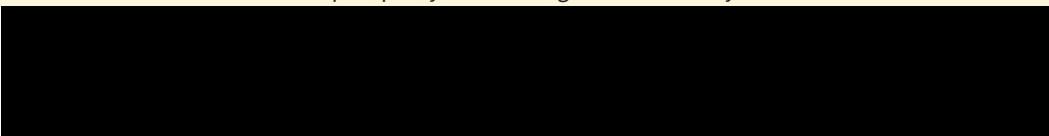
   f. ATP synthase complex is not functional.